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(54) Memory system for use in an image data processing apparatus

(57) A video data processing apparatus converts one of NTSC type and VGA type video signals to the other or overlays the two types of video signals and outputs them as either an NTSC type overlaid video signal or a VGA type overlaid video signal. The memory system has two video memories (156, 174) for storing video signal data. One of the two video memories stores solely VGA tape video data. The other video memory stores either VGA type video data or NTSC type video data depending upon the particular function being carried out by the processing apparatus. Video data may be read out from the other video memory using different scan rates so that an individually dedicated memory is not required for each type of video data in performing the above-mentioned conversations and overlays.

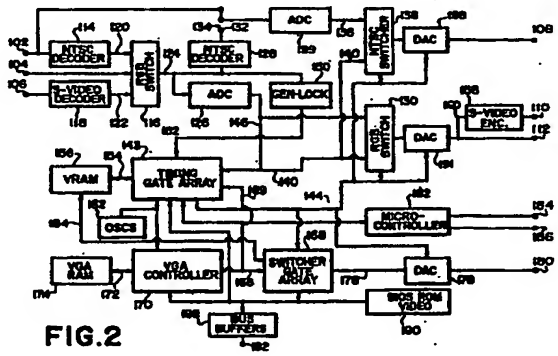

FIG.2

EP 0 833 506 A1

Description

The present invention relates to a memory system for use in an apparatus for mixing image signals and, more particularly to an apparatus for mixing a signal representative of a graphics image generated by a computer and a video signal such as an NTSC signal or the like, representative of a real image. The invention also relates to an apparatus for converting a signal representative of a graphics image into a video signal representative of a real image and vice versa.

Imaging systems available today include one in which, for example, a television (TV) signal generated by a TV camera or a video signal recorded on a video floppy disc by an electronic still camera is inputted to a computer system to be displayed on a monitor in a particular form such as, for example, a video graphics array (VGA) form. This prior art imaging system (US-A-4,956,707) as shown in Figure 7 includes a personal computer 10 and an image recording and reproducing device 12 which are interfaced to each other by an electronics board 97. When recording and reproducing device 12 is loaded with a video floppy disc 18 to read a video signal representative of a real image, the video signal is transformed into corresponding digital data by an analog-to digital converter 98 of electronics board 97 and then developed as bit-mapped data in a dedicated video frame memory 99 also included in the electronics board. The personal computer 10 may then fetch the bit-mapped data later as needed and, thereafter, handle the data as a VGA inage including displaying the data on VGA monitor 16.

Also, graphics in a VGA format generated by a personal computer may be converted to video signals capable of being recorded on a video floppy disc by an electronic still camera using conventional techniques as shown in Fig. 6. In Fig. 6, PC graphics are stored in a dedicated Buffer 1 and are read out by scan converter 2 along line 3 using a read-out rate dependent on the particular type of video signal format desired. In the figure an NTSC video signal capable of being recorded on a video floppy disc is shown as an output of scan conveter 2. However, different scan rates, for examale, PAL or SECAM scan rates, may also be used. The resultant NTSC signal in the figure may then be displayed on NTSC monitor 24.

As shown in Figs. 6 and 7, it is known to provide a conversion from VGA to NTSC and vice versa. However, using the circuits of Figs. 6 and 7, separate and independent hardware is required to store the video signal in its present state before it is converted. For example, in Fig. 6 a dedicated PC Graphics Buffer 1 must be provided to store the VGA signal before it is converted to NTSC by scan converter 2 since the VGA data must be arranged in a predetermined way so that the fixed rate scan converter 2 may properly access it in order to transform the signal to NTSC. Likewise, in Fig. 7 a dedicated frame memory 99 must be provided to store an NTSC signal before it is converted to VGA by the fixed-rate read-out operation of personal computer 10. Therefore, a large amount of hardware is needed in order to convert NTSC video signals to VGA and vice versa.

It is also known (WO-A 88/07310) to insert (overlay) a computer graphics (VGA) signal in selected locations of an NTSC image and to display the thus-combined video signal onto an NTSC monitor such as a conventional TV receiver. Such a conventional system is shown in Fig. 8. An interlaced NTSC video signal is input to input terminal 202 and supplied to video combiner 203. A synchronization component of the input NTSC video signal is supplied to Gen-lock circuitry 201 which provides an output to video format converter 200. Non-interlaced VGA signals are pre-stored in PC graphics memory 100 and are supplied to scan-rate converter 200 which modifies the scan rate of the input non-interlaced VGA signals based on the output of the Gen-lock circuitry 201. The Gen-lock circuitry 201 receives the synchronization component of an input video signal, in this case NTSC, and provides an output to video format converter 200 so that the converter 200 can modify the format of its input, in this case VGA from PC graphics memory 100, so that the output of the converter 200 has a format equal to the input signal to the Gen-lock circuitry 201.

In Fig. 8 the converter 200 modifies the non-interlaced VGA input into interlaced VGA in the NTSC format and supplies the interlaced VGA to Video combiner 203. At this point the VGA signal is of the same format (i.e., interlaced) as the NTSC video signal which is also supplied to video combiner 203. The output 204 of combiner 203 is an interlaced VGA signal overlaid onto an NTSC signal.

It is also known to overlay NTSC video signals onto VGA signals and to display the result onto a VGA monitor using prior art systems. However a dedicated VGA Buffer and a dedicated NTSC video memory are required in the prior art systems.

As is clear from the description of the prior art systems above, a separete and dedicated frame memory or Buffer is required to hold each type of image signal, since a different type of image signal has a different format (i.e., interlaced or non-interlaced). For example, in Fig. 7 a separate dedicated frame memory 99 is required to store the NTSC signal before it is converted to VGA. Further, a separate and dedicated PC Graphics buffer (1, 100) is required in Figs. 6 and 8, respectively, in order to store VGA signals.

Since dedicated Buffers or memories have been required by the prior art, a large amount of hardware is necessary in order to provide image signal processing equipment capable of handling a variety of image signal formats.

As described above, imaging systems available today (IEEE Transactions on Consumer Electronics, 35(1989) No.3, pp 624 to 628) include one in which for example, a television (TV) signal generated by a TV

camera and a video signal recorded in a video floppy by an electronic still camera are inputted to a computer system to be displayed on a monitor in a particular form such as a Video Graphics Array (VGA) image. This prior art imaging system includes a personal computer and an image recording and reproducing device which are interfaced to each other by an electronics board. For example, when the recording and reproducing device is loaded with a video floppy to read a video signal representative of a real image, the video signal is transformed into corresponding digital data by the electronics board and then developed as bit-mapped data in a video memory included in the electronics board. The personal computer may fetch the bit-mapped data later as needed and, thereafter, handle them as VGA image or a part thereof.

The conventional system in which a personal computer and an apparatus for recording and reproducing images from a video floppy are combined allows video data to be transferred from the recording and reproducing apparatus to the personal computer, it does not allow the transfer thereof from the personal computer to the recording and reproducing apparatus. Specifically, with such a system, it is impossible to read a real image out of a video floppy, process it in the personal computer, and then write the processed image again to the video floppy.

With the increasing spread of computer systems and video systems, there is an increasing demand among users for an implementation which makes the most of various merits available with the combination of the two different systems. For example, it is often desired to see the contents of images stored in a video floppy, video tape or similar image recording medium instantaneously in a summarized image. It is also desired to add a title or bibliographic item to such a summarized image and then write the result back to the same recording medium.

In the above-mentioned system, video output signals representing a mixture of a computer graphics (VGA) image and an NTSC-type image are easily displayed on a selected one of a computer graphics (VGA) type monitor or an NTSC-type monitor. However, the combined (overlaid) video image signals are not so easily sent on to an external memory. Difficulties arise in attempting to store an overlaid video signal in an external memory because the speed of the overlaid signal as it comes out of the above-mentioned video processing system is too fast for an external memory to handle. For example, the overlaid signals are sent out at a rate in the Megahertz (MHz) region. It would be useful to be able to store overlaid images in an external memory as an alternative to merely displaying the overlaid image onto a monitor display. By storing overlaid images in an external memory they would be able to be easily and selectably read out and displaced on a monitor at a later time without having to re-overlay the image signals making up the composite overlaid signal. Also, further processing or overlaying of the overlaid signals would be simplified.

A video signal processing apparatus has been described in a co-pending application entitled "Video Processing System Memory for Storing a Variety of Video Signal Formats" and filed in the name of the same applicant as that of the present application and involves a system for converting one of NTSC type and VGA type video signals to the other or overlays the two types of video signals and outputs them as either an NTSC type overlaid video signal or a VGA type overlaid video signal. The processing system has two video memories storing video signal data. One of the two video memories stores solely VGA type video data. The other video, memory stores either VGA type, video data or NTSC type video data depending upon the particular function being carried out by the processing system. Video data may be read out from the other video memory using different scan rates so that an individually dedicated memory is not required for each type of video data in performing the above-mentioned conversions and overlays.

In the above-mentioned system, however, the video signal output of the overlay and rescan board can only be sent to one type of monitor, the monitor capable of handling the scan rate of the board's output video signal.

NTSC-type video signals exist in an interlaced format where the scan lines of one of two fields of a frame of video data are displayed on a monitor and the scan lines of the other field are interlaced between the scan lines of the first field. The interlacing effect makes a signal easier to view from a large distance since glare is reduced by dispensing local intensities within a signal. If this interlaced display is viewed from a close-up distance, for example, in small audience situations, the interlacing of the scan lines produces a visible jitter effect which is unpleasant to the eye. If the interlaced display is viewed from a large distance, for example, in large audience situations, the jitter effect is less noticeable.

VGA-type video signals exist in a non-interlaced, format. This type of display is meant to be observed at a close-up distance, for example, a couple of feet away in computer monitor environments. Since the VGA-type monitor is non-interlaced, the above-mentioned effect of jitter is not observed. However, due to the non-interlacing of scan lines, the monitor is difficult to view from a distance due to glare produced by concentrated local intensities within a signal.

Based on the above discussion, it is clear that an interlaced display is ideal for large distance, for example, large audience situations, and that a non-interlaced display is ideal for small distance, for example, small audience situations. Therefore, it would be useful to provide for a video signal processing system where it is possible to provide a video signal output on either an NTSC-type monitor or a VGA-type monitor.

The object of the invention is to provide a memory system for use in an image signal processing system capable of handling a variety of image signal formats and using a minimum amount of hardware so as to reduce costs of the overall system.

The above object has been attained by the features as claimed in claims 1 and 4, namely by providing an improved image overlay and rescan board capable of receiving image signals of a variety of formats including NTSC image signals representative of a real image and VGA image signals representative of a computer generated graphics image. The overlay and rescan board includes a timing gate-array for addressing a frame memory and for sending and receiving data to and from the frame memory.

Both image signals representative of a real image and image signals representative of a computer generated graphics image are capable of being selectively received by and sent to the timing gate-array depending on the particular type of operation to be performed by the overlay and rescan board. Possible operation of the board include conversion from computer graphics image signals to image signals, representative of real image (such as NTSC video) and vice versa, and over laying of computer graphics image signals onto image signals representative of real images and vice versa.

Depending on the particular operation to be carried out by the overlay and rescan board, the timing gate-array either reads from or writes to the frame memory at a read/write rate dependent on the type of image signal to be read from or written to the frame memory.

In this way, a single frame memory is capable of temporarily storing an image signal of either a computer graphics type or a real image type. Thus, an overlay and rescan board capable of performing a variety of image processing operations having a minimum amount of hardware is achieved.

In an embodiment of the invention an NTSC-type video signal is overlaid onto a VGA-type signal as described above, and further, the overlaid signal is fed to a line buffer which performs scan conversion of the overlaid signal. The scan-converted overlaid signal, which has been either scan-converted to the RGB or NTSC formats, is next displayed on either an RGB or NTSC, respectively, monitor.

A still further object of the invention is to provide a video image processing system in which overlaid image signals, obtained by overlaying VGA-type image signals onto NTSC-type video signals or vice versa, may be easily stored to an external memory.

By placing a feedback connection from an output of a video image switcher, used to combine the signals making up the composite overlaid signal, back to an input of control means used to control the write in/read out rate of an internal frame memory the first and second type of signals are overlaid. The overlaid image, once formed, is fed back to the control means and stored into the internal frame memory. Once the overlaid image has been stored in the internal frame memory it may easily by read out and stored into an external memory at a transfer rate which the external memory can handle, i.e., a transfer rate substantially less than the Megahertz (MHz) range rate at which the overlaid images are provided.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and features of the present invention will become more apparent from the consideration of the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a block diagram schematically showing a preferred embodiment of the video signal mixing apparatus in accordance with the present invention;
Fig. 2 is a schematic block diagram showing a specific construction of an overlay and rescan board included in the illustrative embodiment;
Figs. 3 and 4 each show a specific image which may be produced by the illustrative embodiment;
Fig. 5 shows a specific format of video data applicable to the illustrative embodiment;
Fig. 6 shows a conventional system for converting VGA signals to NTSC image signals;
Fig. 7 shows a conventional system for converting NTSC to VGA image signals;
Fig. 8 shows a conventional system for overlaying VGA onto NTSC image signals;
Figs. 9 and 10 each show a schematic block diagram of a specific construction of an timing gate-array included in the illustrative embodiment;
Fig. 11 shows a switcher gate-array of the illustrative embodiment;
Fig. 12 shows a flow chart for explaining the operation of the switcher gate-array of the illustrative embodiment;
Figs. 13 and 14 each show a specific index image data which may be produced by the illustrative embodiment;
Fig. 15 is a schematic block, diagram showing a specific construction of an overlay and rescan board included in the alternative embodiment; and
Fig. 16 is a schematic block diagram showing a specific construction of an overlay and rescan board included in another alternative embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1 of the drawings, a video or image signal mixing apparatus embodying the present invention is shown and has a personal computer 10 and a rec/player 12 which are interconnected by an overlay and rescan board 14. The personal computer 10 is a commercially available 16-bit or 32-bit processor system and includes program sequences for handling